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Description

OVERHEAD AUTOMOTIVE AIRBAG DESIGN

BACKGROUND OF INVENTION

[0001] The present invention relates generally to an overhead automotive airbag assembly and more particularly to an overhead airbag assembly with limited forward movement.

[0002] Automotive vehicle design is governed by the constant and unending pursuit of improved occupant comfort and safety. Modern vehicles incorporate considerable design and manufacturing efforts to minimize injuries to occupants in the event of vehicle accidents. These safety features, however, must co-exist with the primary functional features as well as the comfort features of the vehicle. Their placement within the vehicle, therefore, must be a function of both operation of the safety component in combination with available placement within the existing vehicle operational structure.

[0003] These physical placement constraints can serve to limit

the freedom of placement of certain features within the automobile. Such is the case with airbag assemblies. Airbag assemblies have proven themselves to be highly beneficial and desirable to consumers. A wide variety of implementation schemes have been devised in order to improve the functionality of airbag protection assemblies. The assemblies, however, are often positioned within traditional mounting structures based upon their operational objectives. Frontal impact airbags, for instance, are commonly positioned immediately forward of the occupant and are designed to inflate towards the occupant upon vehicle impact. This requires installation immediately forward of the occupant in the steering wheel or dashboard. Placement of frontal impact airbags for rear-seated passengers is often impractical or overly complex.

[0004] The resulting design scenario commonly finds these airbag assemblies positioned in these traditional mounting locations. These locations, especially the dashboard, can become prized real estate in automotive design. As additional technology and features are incorporated into automobiles, locations such as the dashboard are desirable for passenger accessible features. Present airbag assemblies can place considerable constraint on the incor-

poration of these new features. It would therefore, be highly desirable to afford an alternate mounting location for forward impact airbag assemblies that provided design flexibility to automotive designers such that that airbag assemblies did not place unreasonable constraints on design creativity.

[0005] On approach to the placement of frontal impact airbag assemblies is to position the assemblies in an overhead position. This arrangement not only addresses the concern for useful real estate on the dashboard, but also can provide access to passengers seated in the rear without complex seat/airbag designs. The nature of present airbag assemblies, however, does not provide adequate restraint in directions perpendicular to inflation. An overhead airbag assembly, therefore, would provide insufficient resistance to forward motion since the passenger is moving in a direction perpendicular to inflation. The lack of forward motion resistance is further exacerbated by the relatively small airbag mounting arrangements. The mounting structures are commonly small compared to the inflated bags and therefore provide inadequate support for the resistance of perpendicular forces. It would, therefore, be highly desirable to have an overhead airbag assembly de-

sign with improved forward motion resistance.

SUMMARY OF INVENTION

[0006] It is, therefore, an object of the present invention to provide an automotive overhead airbag assembly with forward motion resistance. It is a further object of the present invention to provide an automotive overhead airbag assembly with improved overhead installation characteristics.

[0007] In accordance with the objects of the present invention, an automotive overhead airbag assembly is provided. The automotive overhead airbag assembly includes an airbag mounted on an inside surface of a vehicle roof at an airbag mount position. The airbag has an airbag stored condition and an airbag deployed position and expands downwards from said vehicle roof when in the airbag deployed position. The assembly includes at least one wing element having a first wing mounting edge mounted to the vehicle roof and a second wing mounting edge mounted to a lower deployed portion of said airbag. The first wing mounting edge extends in a transverse direction from the airbag mount position. The at least one wing element includes a wing stored condition and a wing deployed position. The at least one wing element restricts

forward motion of the airbag when the airbag is in the deployed position. The assembly includes a trampoline surface formed by the at least one wing element when the at least one wing element is in said wing deployed position. The trampoline surface absorbs passenger forward momentum during vehicle impact.

[0008] Other objects and features of the present invention will become apparent when viewed in light of the detailed description of the preferred embodiment when taken in conjunction with the attached drawings and appended claims.

Brief Description of Drawings

[0009] FIGURE 1 is a side-view illustration of an overhead airbag assembly in accordance with the present invention, the assembly illustrated in the airbag deployed position;

[0010] FIGURE 2 is a detail illustration of the overhead airbag assembly, the overhead airbag assembly illustrated in the airbag stored position; and

[0011] FIGURE 3 is a rear view illustration of the overhead airbag assembly illustrated in Figure 1, the view illustrating the assembly wing elements.

Detailed Description

[0012] Referring now to Figure 1, which is an illustration of an

automotive overhead airbag assembly 10 in accordance with the present invention. The overhead airbag assembly 10 is intended to be utilized in a wide variety of vehicles for a wide variety of specific configurations. It is intended, however, to provide overhead deployed airbag protection to an occupant 12 positioned within the interior 14 of a vehicle 16, such as within a vehicle seat 18. The present invention provides such protection in addition to increasing airbag engagement area and reducing forward motion.

[0013] The present invention accomplishes these goals by including an airbag 20 mounted on an inside surface 22 of the vehicle roof 24 at an airbag mount position 26. Although a variety of airbag mount positions 26 on the vehicle roof 24 are contemplated and may be optimized for specific applications, one embodiment contemplates the placement of the airbag mount position 26 on the vehicle roof rail 28 (see Figure 2). The airbag 20 has an airbag stored condition 30 (Figure 2) and an airbag deployed position (Figure 1) 32. The airbag 20 expands downward from the vehicle roof 24 to move from the airbag stored condition 30 to the airbag deployed position 32.

[0014] The present invention improves the performance of the airbag 20 by including at least one wing element 34 hav-

ing an upper wing mounting edge 36 mounted to the vehicle roof 24 and a side wing mounting edge 38 mounted to a lower deployed portion 40 of the airbag 20. The at least one wing element 34 has a wing stored condition 42 (Figure 2) and a wing deployed position 44 (Figure 1). The at least one wing element 34 is utilized to restrict forward motion of the airbag 20 when the airbag 20 is in the airbag deployed position 32. This is important since the airbag module 46 is commonly relatively small in size compared to the deployed airbag 20 and therefore does not alone supply sufficient passenger forward momentum 60 restraint. It is contemplated that the at least one wing element 34 can be formed in a variety of fashions. It may be formed as a triangular wing element as illustrated in Figure 3. It may be further comprised of a first wing element 48 and a second wing element 50. The first wing element 48 extends in a first transverse direction 52 from the airbag mount position 26. The second wing element 50 extends in a second transverse direction 54 from the airbag mount position 26. By extending the wing elements 48,50 in generally opposing transverse directions 52,54 an extended passenger engagement surface 56 is generated. The extended passenger engagement surface 56 ex-

tends the practical airbag 20 surface area. In addition, it acts as a trampoline surface to further absorb passenger momentum. These characteristics are further improved through the introduction of a rearward mounting point 58, rearward of the airbag mount position 26, even with generally opposing transverse directions 52,54.

[0015] The wing elements 48, 50 are attached to the airbag 20 preferably by way of the side wing mounting edge 38 which is vertically mounted to the airbag 20. The side wing mounting edge 38 may be attached to the airbag 20 in a variety of fashions, although stitching the side wing mounting edge 38 to the inner surface 62 of the airbag 20 is preferred. The airbag 20 can be divided into three vertical sections, a right vertical section 64, a center vertical section 66, and a left vertical section 68. The wing elements 48, 50 are preferably mounted to opposing edges 70 of the center vertical section 66. This optimizes the fore/aft restraint generated by the wing elements 48,50. The right vertical section 64 and left vertical section 68 can be folded over the center vertical section for installation into the airbag module 46. Although the wing elements 48,50 can be mounted to the vehicle roof 24 all along the upper wing mounting edge 36, it is contem-

plated that they may be physically attached in a plurality of mounting locations 71 to simplify assembly while providing sufficient support.

[0016] The airbag 20, when in the airbag stored condition 30, is stored within an airbag module 46 mounted to the roof rail 28. A slotted guide 72, or pair of slotted guides, formed in the airbag module 46 allows the wing elements 48,50 to extend from the airbag module 46 in the transverse directions 52,54 for mounting to the vehicle roof 24 even while the airbag 20 is in the airbag stored condition 30. The first wing element 48 and second wing element 50 can be stored within a slotted chamber 74 formed in the vehicle roof 24, such as in the headliner, such that they are hidden from view while in their respective first wing stored condition 76 and second wing stored condition 78. Upon inflation of the airbag 20, the first and second wing elements 48,50 are pulled downward into a first wing deployed position 80 and second wing deployed position 82 (see Figure 2). The material of the wing elements 48,50 is thereby stretched to form a trampoline surface 56 that, as trampolines do, absorbs momentum efficiently.

[0017] While particular embodiments of the invention have been

shown and described, numerous variations and alternative embodiments will occur to those skilled in the art. Accordingly, it is intended that the invention be limited only in terms of the appended claims.